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Weather Volatility and Farm Bill Options

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lose acres in the final three years. Total corn and soybean acres would increase from 2001 to 2004 as farmers try to capture more market derived net farm income. The acres that they put into production come from the land leaving the CRP.

Average Annual Effects of Farm Bill Options on Selected Variables in Iowa

Corn and Soybean Planted Area

Crop Years	*96/97-00/01*	*2003/04*
	(Thousand acres)	
Baseline Value	21,841	23,064
- 25 percent Flex	Up 221	Up 335
- Revenue Assurance	Up 600	Up 429
- No Program	Up 323	Up 176

Corn Planted Area

Crop Years	*96/97-00/01*	*2003/04*
	(Thousand acres)	
Baseline Value	13,085	13,533
- 25 percent Flex	Down 157	Down 180
- Revenue Assurance	Up 166	Up 3
- No Program	Down 57	Down 138

Soybean Planted Area

Crop Years	*96/97-00/01*	*2003/04*
	(Thousand acres)	
Baseline Value	8,756	9,530
- 25 percent Flex	Up 378	Up 514
- Revenue Assurance	Up 434	Up 426
- No Program	Up 379	Up 313

Crop Receipts

Calendar Years	*1996-2000*	*2003*
	(Million)	
Baseline Value	$4,908	$5,689
- 25 percent Flex	Up $28	Up $75
- Revenue Assurance	Up $134	Up $244
- No Program	Up $155	Up $231

Government Payments

Calendar Years	*1996-2000*	*2003*
	(Million)	
Baseline Value	$869	$728
- 25 percent Flex	Down $142	Down $116
- Revenue Assurance	Down $384	Down $554
- No Program	Down $608	Down $554

Net Farm Income

Calendar Years	*1996-2000*	*2003*
	(Million)	
Baseline Value	$1,349	$1,171
- 25 percent Flex	Down $142	Down $83
- Revenue Assurance*	Down $320	Down $136
- No Program	Down $526	Down $334

**Net Farm Income under Revenue Assurance contains Revenue Assurance benefits paid to the farmer by the Federal Government.*

Planted area is higher under Revenue Assurance and the risk component of agriculture is reduced, relative to the other options, so banking institutions would be willing to lend more money for operating expenses.

No Program and 25 percent Flex are in the middle range of planted area for all the years. The difference occurs when flex is increased and farmers leave the program because the perceived benefits are less than the perceived costs. With the 25 percent Flex option comes a reduction in payments, and thus the program may not prove to be worth the costs of compliance. The lowest planted area shows up in the baseline, where net returns are the highest and ARPs are in effect. The corn and soybean plantings rise across all scenarios in the final three years of the baseline projection period because of the expiration of the CRP.

Budget Impact on Programs

In evaluating the previous results, it is important to note that the baseline scenario is under full CCC funding over the time period. The current budget resolution calls for a nationwide reduction in CCC funding of $8.4 billion over five years and $13.4 billion over seven years. This would be the contribution of agriculture programs to achieve a balanced budget.

Farmers would derive numerous indirect benefits from deficit elimination that are not included in the above analysis. Interest rates should be lower because the government will not demand money in the form of loans from commercial banks. The regulatory environment may not be as stringent on agriculture. If such benefits from a balanced budget are realized, farm production costs would decline and net farm income would be higher.

Each of these policy options will have a different impact on the future of Iowa agriculture. The underlying question of what impact the Farm Bill policy will have on the financial picture of the Iowa agricultural economy will not be determined for years. This analysis provides a look at some of the variations that may occur if certain policy options are enacted into law.

Weather Volatility and Farm Bill Options

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To provide additional insight to the agricultural policy debate, FAPRI has introduced weather volatility into its analysis of three alternative farm program designs. The three scenarios were previously studied and presented to Congressional staff under the assumption of "normal" weather. The extended analysis, discussed in this article, incorporated weather volatility that was experienced in the 1980s into the 1995 FAPRI baseline

and the three options presented in the last issue of this publication. The three alternatives evaluated are:

- **No Program** (NP) — elimination of all budget driven agricultural policies
- **Marketing Loan** (ML) — conversion of current programs to marketing loans
- **Revenue Assurance** (RA) — provides producers with safety net on revenue

Among other differences, the export enhancement program was eliminated under the NP and ML scenarios and was retained under the RA option. More complete details of the three options are discussed in the June issue of *Iowa Ag Review*.

Considerable volatility exists in U.S. agricultural crop production. The vagaries of weather, the export market situation, and shifts in government policy contribute to large year-over-year shifts in production, utilization, and prices of agricultural commodities. In reality, weather induced supply shocks carry forward into future behavior impacting acreage planted, livestock production, and end-of-year stockholdings. Because assuming normal weather precludes evaluation of how volatility impacts these variables, an analysis highlighting recent weather shocks was deemed advisable.

The analysis assumed that the weather of the 1980s repeats, beginning with the 1996 crop year projections. Weather for 1996 is assumed to be identical to the weather of 1982. Thus, the drought of 1983 affects 1997 yield projections and the 1988 drought decreases projections of yields for 2002. Individual crop tables are not shown, but corn yields, for example, fall below expected yields by 33.6 and 34.4 bushels per acre for the years 1996 and 2002, respectively. Over the full analysis, yield changes vary considerably by crop and region. While corn yields were largely down in 1997, wheat yields were above trend for that crop year. Cotton had yield decreases in 1997 and 2000, but was above trend for 2002.

Among other things, this study was undertaken to answer several fundamental questions:

1. How does weather uncertainty affect FAPRI baseline values, especially key aggregates?
2. How do alternative programs compare in terms of volatility of prices to consumers, volatility of net farm income to producers, and volatility of program costs to the government?

Weather impacts under the baseline are compared in terms of average levels and variability of key aggregates (Table 1). Here standard deviation over the period is used as the measure of volatility. To illustrate results, baseline crop receipts are, on average, at higher levels with weather variability increasing from $97.61 billion to $98.95 billion. Crop receipt volatility is also slightly higher with variable weather as standard deviation increases to 6.88 from 5.48.

Table 1. Impacts of 1980s Weather on Baseline (Current Program) Projections that Assumed Average Weather.

	Average Weather		1980s Weather	
	Mean	Standard Deviation	Mean	Standard Deviation
	(Billion Dollars)			
Crop Receipts	97.61	5.48	98.95	6.88
Livestock Receipts	96.35	6.52	97.22	7.21
Feed Expense	24.07	1.09	25.24	2.85
Total Production Expenses	172.50	7.15	174.38	9.13
Net Farm Income	47.46	4.93	46.57	7.23
Net CCC Outlays	7.63	0.95	6.68	2.08
Total Food Expenditure	541.82	47.66	544.12	48.99
Meat Bundle Price	1.78	0.03	1.80	0.04

In general, for baseline comparison purposes (question one above), the results indicate that inclusion of weather variability tends to result in slightly higher prices on average and increased volatility. The largest percentage effect was to CCC expenditures as they were reduced by 12.5 percent on average and volatility nearly doubled. Weather variation provided slightly lower estimates of farm income with volatility, again measured by standard deviation, increasing by nearly 50 percent from 4.93 to 7.23. Interestingly, consumer food expenditures showed less than a 0.5 percent increase from weather variability with only a slight change in volatility as measured by standard deviation.

Table 2. Impacts of 1980s Weather on Key Aggregates Under Alternative Policies.

	Net Farm Income		CCC Outlays		Consumer Expenditure	
	High	Low	High	Low	High	Low
	(Billion Dollars)					
Current Programs	57.52	33.10	9.32	3.39	624	472
Marketing Loan	55.20	31.44	10.52	2.82	622	472
Revenue Assurance	56.25	34.40	7.48	1.80	623	472
transition payments			5.06	0.00		
revenue assurance			1.50	1.28		
export programs			0.92	0.52		
No Program	54.40	27.40	3.49	0.08	622	470

In comparing the volatility of key aggregate variables across alternative farm programs, Table 2 shows that the high and low values for consumer expenditures were quite similar over the ten-year projection period. As expected, continuation of current programs showed the highest farm income with the NP scenario having the lowest levels of income. Extremes in farm income

(the range between the high and low values) were lowest under RA and largest under NP. The range of CCC expenditures was largest under ML, implying that if certainty of federal budget exposure is important, this ML option does not perform well. CCC outlays under RA are separated into these categories, since transition payments and export subsidies are on a fixed and declining schedule. The cost of the revenue assurance indemnities, however, do vary from year to year; but the variation over this period is less than $250 million.

A general conclusion of this study is that if consumer price stability is one of the objectives of farm programs, then the current program structure is not contributing significantly to this goal. The inclusion of weather variability showed little difference between the current programs and that of other scenarios in consumer expenditure variation analyzed. The results also indicate only a slight reduction in net farm income volatility due to changes in policy structure. Differences between high and low values varied only slightly across current programs, ML, and RA, although it was significantly larger under NP. While this study compares only a few options, it indicates that there are other program designs that perform as well or better in stabilizing net farm income and consumer expenditures.

How Revenue Assurance and Yield Insurance Stack Up: A Cost Comparison

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What percentage of expected revenue would be assured to agricultural producers if government yield insurance was transformed into a revenue assurance type of safety net program? Recent interest in a potential dual federal crop insurance program that would offer producers the option of yield or revenue insurance at the same level of U.S. government subsidy prompts this question. Here, we illustrate what level of revenue insurance coverage might be obtained given a fixed amount of government expenditure. We have assumed that average U.S. Federal Crop Insurance totals $0.5 billion per year — the formulation of this dollar amount is described later. We then estimate the level of revenue insurance obtainable with the given expenditure level. The reader is forewarned that several assumptions are crucial to the estimates provided below.

Estimating Revenue Assurance Costs

For the FAPRI Weather scenario presented in the previous article, the shocks are induced into the weather variables which in turn affect yields and other explanatory variables used in the FAPRI system. Because detailed weather information is not readily available at the state level, translation of the shocks from the USDA cost of production regional level to the state level is performed using yield deviations. Revenue per acre is computed as the product of farm price and yield for each state.

In the Average Weather Revenue Assurance scenario, gross revenue is taken to be normally distributed and non-negative. Cost of revenue assurance per acre for each state and crop combination is estimated by evaluating the probability of realized revenue falling below a threshold proportion of expected revenue. This fixed cost per acre is then multiplied by acres planted by state to derive an aggregate U.S. cost.

For the Variable Weather Revenue Assurance scenario, the cost is estimated in each simulation year using the average of the previous five years of revenues as the mean revenue. Thus, revenue assurance costs per acre for each state and crop combination are updated in each simulation year in the Weather scenario.

Comparing Revenue Assurance/Yield Insurance Costs

Average historical crop insurance costs for each crop, and in total for 1989-1994, are computed as the total of the average government total premium subsidy, average excess loss, and a 30 percent reimbursement of average total premiums to private insurers over the time period. The sums of these cost estimates are used as the benchmark government funding amounts assumed for yield insurance. As a result, they can then be used for the revenue assurance comparison.

Given these figures, the percentage of revenue that could be ensured is varied to equate the average payout with Revenue Assurance under the Weather scenario for 1996-2003 to the average crop insurance costs for 1989-1994 by crop and in total. Preliminary results are given in Table 1. With the 1994 Federal Crop Insurance reform that replaced disaster payments with low catastrophic coverage, this is likely to be a conservative estimate of future yield insurance cost. The following notes list estimation caveats:

- FCIC overhead and administration costs are not included in the average crop insurance cost estimates.